Radionuclide Safety Data Sheet

PHYSICAL DATA

Radionuclide:	Phosphorous-33 (P-33)
Decay Mode:	Beta (100% abundance)
Beta Energy:	249 keV (maximum); 85 keV (average)
Physical Half-Life:	25.4 days
Biological Half-Life:	1155 days (Mineral Bone) 257 days (Whole Body)
Effective Half-Life:	24.9 days
Maximum Beta Range in Air:	51 cm = 20”
Maximum Beta Range in Water/Tissue:	0.06 cm = 0.025” P-33 beta particles CANNOT penetrate lens of eye (0.3 cm)
Maximum Beta Range in Lucite/Plastic:	0.05 cm = 0.020”

RADIOLOGICAL DATA

Critical Organ:	Bone for soluble forms Lung (inhalation) and GI Tract/LLI (ingestion for insoluble forms and non-transportable P-33 compounds
Routes of Intake:	Ingestion, Inhalation, Puncture, Skin Contamination (Absorption)
Exposure Concerns:	Internal exposure and contamination (millicurie quantities are NOT an external concern)
Annual Limit on Intake (ALI):	6 mCi (ingestion all compounds) 8 mCi (inhalation for all compounds except phosphates of Zn^{2+}, S^{3+}, Mg^{2+}, Fe^{3+}, Bi^{3+}) 3 mCi (inhalation for all compounds except phosphates of Zn^{2+}, S^{3+}, Mg^{2+}, Fe^{3+}, Bi^{3+}) (1 ALI = 5 rem CEDE)

SKIN CONTAMINATION (P-33):

Localized Dose Rate to Basal Cells at 7 mg/cm^2 or 0.007 cm tissue depth (without air reflection)
Skin Contamination Dose Rate (Extremity Skin): 3182 mrem/hour per 1 uCi/cm2
P-33 beta particles CANNOT penetrate lens of the eye (0.3 cm)

SURVEY INSTRUMENTATION:

P-33 can be detected with a survey meter equipped with a GM probe (pancake probe preferable)

Counting efficiency of P-33 with GM survey meters is about 6%
Wipes/smears should be counted on a liquid scintillation counter to detect P-33 contamination. Counting efficiency on a Perkin Elmer liquid scintillation counter is approximately 95%.

SHIELDING/LABELING

Shielding : Low atomic number material (e.g., 1/8" Lucite, plastic, acrylic) is recommended if working or storing millicurie amounts of P-33.

Labeling: Container with $\geq$ 100 uCi must be labeled "Caution, Radioactive Material"

PERSONAL RADIATION MONITORING DOSIMETERS

Personnel dosimetry (whole body & ring badges) are typically NOT required when working with P-33

BIOASSAY REQURIEMENTS

Not normally required. Notify Radiation Safety if an intake of P-33 is suspected

DOSIMETRY

Millicurie quantities of P-33 do not present a significant external exposure hazard because the low energy betas emitted barely penetrate glove and the horny outer layer of skin. Phosphorus metabolism is complex; 30% is rapidly eliminated from the body, 40% goes to soft tissue with a 19 day biological half-life, and the remaining goes to mineral bone which is reduced by its physical half-life of 25.4 days.

RADIOACTIVE WASTE

Isolate waste from other radionuclides in clearly labeled containers.
Sanitary sewer disposal limit is 100 uCi in any one day via a designated "hot" sink provided it is readily soluble, dispersible in water, and contains no hazardous materials. A sewer log must be maintained.

GENERAL RADIOLOGICAL SAFETY INFORMATION (P-33)

(Permission from University of Michigan Radiation Safety Office)

- Inherent Volatility (STP): Insignificant / Negligible. P-33 is not volatile, even when heated and can be ignored as an airborne contaminant unless aerosolized.
- White wine vinegar can be an effective decontamination solvent for this nuclide in most common chemical forms. Skin dose, internal contamination, and area contamination are the primary radiological concerns.
- Drying can form airborne P-33 contamination.
- Always wear a lab coat and disposable gloves when handling P-33.
- Monitor work areas for removable surface contamination by smearing, swabbing, or wipe testing where P-33 is used. Count smears or swabs in a liquid scintillation counter (LSC).